Lab 8: NORMALIZATION

**Steps:**

1. Create the **Unnormalized Form** (UNF) relation from a user view

2. Identify a **Multi-valued Dependency** (a.k.a. Repeating Group )

3. Create the **First Normal Form** (1NF) relation from the UNF.

Definition: **Normalization** is the process of assigning attributes to relations in such a way that data redundancies are reduced or eliminated.

Definition**: User Views** can be individual descriptions, reports, forms, or lists of data that are required to support the operations of a particular database user.

Step 1: Create UNF Relation from a User View. The goal here is to create a single relation for the data found in the user view. The method used is:

* **Examine the user view**
* **Identify all attributes**
* **Describe the user view using DBDL**

Here is an example of a user view. This reports lists the customers of the Premiere Corporation.

**Premiere Corporation Customer List**

**Cust Name Street City State Zip Sales**

**No Code Rep #**

124 Sally Adams 482 Oak Lansing MI 49224 03

256 Ann Samuels 215 Pete Grant MI 49219 06

311 Don Charles 48 College Ira MI 49034 12

315 Tom Daniels 914 Cherry Kent MI 48391 06

405 Al Williams 519 Watson Grant MI 49219 12

412 Sally Adams 16 Elm Lansing MI 49224 03

522 Mary Nelson 108 Pine Ada MI 49441 12

1. **Examine the user view:** As you examine this report, you can see that it contains a title, a line of column headings and the body of the report. Each line in the body of the report contains data about a particular customer. For example we can see that in the first line of the body of the report, there is data about Customer 124. This customer’s name is Sally Adams and she lives at 482 Oak in Lansing,Michigan (MI). The Sales Representative who calls on Sally Adams is Sales Rep Number 03.
2. **Identify all attributes:** The attributes (or characteristics) of a User View can often be found by simply looking at the column headings. In our Customer Report we see that we have the following attributes: Customer Number, Customer Name, Street, City, State, Zip Code and Sales Representative Number.
3. **Describe the relation using DBDL:** Database Design Language (DBDL) is a standardized way of describing relations of a relational database. You describe a relation by:
4. Choose an appropriate name for the relation. We chose to name our relation **CUSTOMER** because each line in the report describes customer data.
5. List the attributes you found in the user view inside square brackets, giving each attribute a suitable attribute name. Note: *calculated fields or derived fields* should not be included in the DBDL
6. Determine which attribute would be suitable as a primary key and underline that attribute.

The DBDL for the relation resulting from our Customer user view would look as follows:

**CUSTOMER [ CustNo, CustName, CustStreet, CustCity, CustSt, CustZip, CustRep ]**

Now you try it. Examine the following report:

**Premiere Corporation Parts List**

**Part Part Qty Class Warehouse Price**

**Number Description On Hand**

AX12 Iron 104 HW 3 24.95

AZ52 Dartboard 20 SG 2 12.95

BA74 Basketball 40 SG 1 29.95

BH22 Cornpopper 95 HW 3 24.95

BT04 GasGrill 11 AP 2 149.99

BZ66 Washer 52 AP 3 399.99

CA14 Griddle 78 HW 3 39.99

CB03 Bike 44 SG 1 299.99

CX11 Blender 112 HW 3 22.95

CZ81 Treadmill 68 SG 2 349.95

What type of data does each line in the report represent?

There are six columns which represent the Number associated to a particular part, the description of the part, quantity of the parts, the class of the part, warehouse storage and price of the part.

What attributes can you identify from the user view?

\_\_\_\_Part\_Number\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_Part\_Description\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_Qty\_On\_Hand\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_Class\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_Warehouse\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_Price\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What would be a suitable name for the UNF relation? \_\_\_\_\_\_\_PARTS\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which attribute would be suitable as a primary key? Part\_Number and Part\_Description

Describe the UNF relation using DBDL:

**PARTS [Part\_Number, Part\_Description, Qty\_On\_Hand, Class, Warehouse, Price].**

**=====🡺 Enter this DBDL on the lab submission page which is the last page of this lab.**

**Step 2: Recognize Multi-valued Dependencies.**

Definition: **Unnormalized form (UNF)** is a relation that contains one or more **Multi-valued Dependencies***.*

Definition:A **Multi-valued Dependency** is an attribute or collection of attributes within a relation that has multiple values for a single value of the primary key for that relation.

For example, looking at the following User View, we see that for each Customer number, it is possible to have **multiple values** for the order number and order date attributes. Therefore the order number and date are a multi-valued dependency.

**Premiere Corporation Customer Orders**

**Customer Name Order Order**

**Number Number Date**

124 Sally Adams 12489 2016-09-02

12500 2016-09-05

256 Ann Samuels 12495 2016-09-04

311 Don Charles 12491 2016-09-02

315 Tom Daniels 12494 2016-09-04

522 Mary Nelson 12498 2016-09-05

12504 2016-09-05

Identify multi-valued dependencies in DBDL by placing brackets around them. For example the DBDL for this User View would look like this:

**CUSTOMER [ CustNo, CustName, ( OrderNum, OrderDate ) ]**

Notice the brackets around the OrderNum and Orderdate attributes. This quickly and easily identifies a multi-valued dependency to someone who is reading the DBDL.

**Common Mistake:** A common mistake is to incorrectly identify repeating data as a multi-valued dependency. For example, the previous report could also have been printed in the following way:

**Premiere Corporation Customer Orders**

**Customer Name Order Order**

**Number Number Date**

124 Sally Adams 12489 2016-09-02

**124 Sally Adams**  12500 2016-09-05

256 Ann Samuels 12495 2016-09-04

311 Don Charles 12491 2016-09-02

315 Tom Daniels 12494 2016-09-04

522 Mary Nelson 12498 2016-09-05

**522 Mary Nelson**  12504 2016-09-05

The fact that the Customer Number and Name for Sally Adams and Mary Nelson have been repeated on multiple lines does **not** make Customer Number and Name a multi-valued dependency! You should still identify that for one customer number, there are multiple values for the order number and date. Note that this does not mean that EVERY customer number will have multiple order numbers, just that this user view shows that it is possible for some customer numbers to have multiple values for Order Number and Date. The Multi-valued Dependency must be identified in the DBDL. Note also that it is possible to have more than 1 multi-valued dependancy.

**Step 3: Create 1NF relations from UNF.**

Definition: A relation is in **1NF** if it does not contain any multi-valued dependencies.

Therefore, the process of taking a relation from UNF to 1NF, involves resolving the multi-valued dependencies.

**Method:**

* **Choose a primary key for the multi-valued dependancy.**
* **Identify the primary key of the multi-valued dependancy by underlining it or writing (PK) .**
* **Rewrite the DBDL by removing the paranthesis and concatenating the original primary key with the primary key of the multi-valued dependency.**
* **Rewrite the DBDL with the two-part Primary Key and include all the non-key attributes.**

For example, using our previous report from part B, we had the following:

UNF: Customer [ CustNo, CustName, ( OrderNum, OrderDate ) ]

1. **Choose a primary key for the repeating group:** **OrderNum** would make a suitable primary key for the repeating group as it uniquely identifies the data in the repeating group.
2. **Rewrite the DBDL by removing the paranthesis and concatenating the original primary key with the primary key of the multi-valued dependency.**

CustOrder [ CustNo, OrderNum, CustName, OrderDate ]

NOTE: If we start with a relation that does not contain any multi-valued dependencies, it is already in 1NF.

**Lab 8 Submission:**

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**1. Answer from Part A ( Bottom of Page 2):**

**UNF: PARTS [PartNumber, PartDescription, QtyOnHand, PartClass, PartWarehouse, PartPrice].**

**2. For the following User View, determine the UNF and the 1NF and upload on BlackBoard.**

**Premiere Corporation Order Detail Report**

**Order Order Cust Part Part Number Quoted Total**

**Number Date Number Number Desc Ordered Price**

12489 2016-09-02 124 AX12 Iron 11 14.95 164.45

12491 2016-09-02 311 BT04 GasGrill 1 149.99 149.99

BZ66 Washer 2 399.99 799.98

12494 2016-09-04 315 CB03 Bike 4 279.99 1,119.96

12495 2016-09-04 256 CX11 Blender 2 22.95 45.90

12498 2016-09-05 522 AZ52 Dartboard 2 12.95 25.90

BA74 Basketball 4 24.95 99.80

12500 2016-09-05 124 BT04 GasGrill 3 149.99 449.97

12504 2016-09-05 522 CZ81 Treadmill 2 325.99 651.98

**UNF:**

**CUSTOMER [ OrderNumber, OrderDate, CustNumber, (CustPartNumber, CustPartDesc, CustNumberOrdered, CustQuotedPrice, CustTotal)]**

**1NF:**

**CustOrder [ OrderNumber, CustNumber, CustPartNumber, OrderDate, CustPartDesc, CustNumberOrdered, CustQuotedPrice, CustTotal ]**